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SEWERS, AND CULVERTS

A SERIES OF EXAMPLES

ADAPTED

FOR APPLICATION IN THE CONSTRUCTION OF ROADS AND RAILWAYS,
AND IN THE DRAINING OF TOWNS & DISTRICTS.

Bridges

FOR CUTTINGS FROM SEVEN FEET TO SIXTY FEET IN DEPTH, AND FOR EMBANKMENTS
SEVEN FEET TO SIXTY FEET IN HEIGHT.

Culverts

FROM TWO FEET TO EIGHT FEET IN DIAMETER, OF APPROVED SECTIONAL FORM,
ACCORDING TO A SYSTEM OF PROPORTIONS READILY APPLICABLE
TO ALL OTHER DIMENSIONS.

Each Example being fully Exhibited in Working Plans & Sections

WITH FIGURED DIMENSIONS,

AND ACCOMPANIED BY A BILL OF QUANTITIES, BY WHICH THE ECONOMICAL EFFECT OF
IN DESIGN AND DIMENSIONS MAY BE COMPUTED WITH FACILITY, AND THE WORK
THE OFFICE BE MATERIALLY REDUCED IN THE PREPARATION OF
APPROXIMATE AND DETAILED ESTIMATES.

BY

G. DRYSDALE DEMPSEY, C.E.

LONDON

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BRICK BRIDGES, SEWERS, AND CULVERTS

THE Series of Illustrations presented in the accompanying Plates is intended to exhibit the kind of construction which may be economically adopted in the formation of bridges of brickwork, for various depths of cutting, and heights of embankment. The dimensions are in all cases reduced to a minimum, so that such additional thickness as may be demanded to meet the particular circumstances in each instance may be readily provided for; and with this is also a detailed bill of the quantities of excavation and materials in each case, as is given in the following pages. By this arrangement it is submitted that alterations may be readily computed, and approximate as well as accurate estimates may be prepared without involving the labour required for taking the entire quantities of each altered design.

Attention may be directed to two economical methods of constructing parapets or railing to the sides of the roads and railways, as exhibited in the accompanying plates, and shown in detail on sheet No. 10. By these and similar methods of forming these portions of the work the required breadth of the entire structure is considerably reduced, and a saving in the quantity and cost effected. This saving becomes of more importance in proportion to the depth or height of cutting or embankment in which the bridge is constructed.

The Working Plans, Sections, &c. of Sewers and Culverts contained in sheet No. 11 of this series, are designed to secure due economy in the construction, with that efficiency in the section of the channel which is known to

BRICK BRIDGES,

PLATES 1 to 10.

QUANTITIES.

BRIDGE IN SEVEN FEET CUTTING. — (Plate No. 1.)

MAVATION.

| | | | | | Cubic Feet. | | Yds. Ft. In. |
|------------|----|------|-----|-----|-------------|---------------|-------------------|
| its | 4/ | 26 0 | 3 0 | 4 0 | = | 1248 0 | |
| ” ” | 2/ | 34 0 | 4 0 | 4 6 | = | 1224 0 | |
| orts | 3/ | 4 0 | 3 0 | 4 6 | = | 162 0 | |
| | | | | | | <u>2634 0</u> | or <u>97 15 0</u> |

OKWORK.

| | | | | | | | |
|-------------|----|------|-------|------|---|---------------|-------------------|
| its | 4/ | 2 3 | 2 3 | 1 0 | = | 20 3 | |
| ..... | 4/ | 6 6 | 1 11 | 1 0 | = | 49 10 | |
| ” ” | 4/ | 6 6 | 2 3 | 1 0 | = | 58 6 | |
| ” ” | 4/ | 5 6 | 2 7½ | 1 0 | = | 57 9 | |
| ” ” | 4/ | 5 8 | 3 0 | 1 0 | = | 68 0 | |
| ..... | 2/ | 28 9 | 3 9 | 1 0 | = | 215 7½ | |
| ” ” | 4/ | 5 3 | 1 0 | 0 4½ | = | 7 10½ | |
| forts | 6/ | 3 9 | 3 0 | 1 0 | = | 67 6 | |
| ” ” | 2/ | 26 8 | 16 0 | 3 0 | = | 2560 0 | |
| ..... | 4/ | 4 0 | 13 6 | 0 4½ | = | 81 0 | |
| ” ” | 4/ | 5 0 | 4 6 | 0 7½ | = | 56 3 | |
| alls..... | 4/ | 5 6 | 2 3 | 14 0 | = | 693 0 | |
| ” ” | 4/ | 5 6 | 1 10½ | 11 0 | = | 453 9 | |
| ” ” | 4/ | 6 6 | 1 6 | 6 6 | = | 253 6 | |
| ” ” | 4/ | 6 6 | 1 2 | 2 8 | = | 80 11 | |
| ” ” | 4/ | 24 0 | 2 6 | 1 6 | = | 360 0 | |
| | | | | | | <u>5083 9</u> | or <u>188 7 9</u> |
| ..... | 1/ | 34 0 | 31 8 | 1 6 | = | 1615 0 | or <u>59 22 0</u> |

BRICK BRIDGES.

| BRICKWORK—(continued.) | | | | | Cubic Feet. | | |
|------------------------|----|------|-----|------|-------------|--------|----|
| Backing | 2/ | 4 6 | 6 4 | 31 8 | = | 1805 0 | or |
| Spandrills..... | 2/ | 20 3 | 2 4 | 1 6 | = | 141 9 | or |
| Parapet piers | 4/ | 4 0 | 4 0 | 1 2 | = | 74 8 | or |
| Drains | 2/ | 52 0 | 4 9 | 0 4½ | = | 185 3 | or |

| STONEWORK. | | | | | | | |
|--------------------------|----|------|------|------|---|-------|--|
| String-course | 2/ | 31 0 | 2 2 | 0 9 | = | 100 9 | |
| „ „ „ | 4/ | 6 0 | 2 10 | 0 9 | = | 51 0 | |
| | | | | | | 151 9 | |
| Copings | 4/ | 4 6 | 1 5 | 0 4½ | = | 9 7 | |
| Imposts..... | 2/ | 1 8 | 1 10 | 32 0 | = | 195 7 | |
| Coping on Wing walls ... | 4/ | 22 0 | 1 10 | 0 3 | = | 40 4 | |
| „ „ „ | 4/ | 1 10 | 1 10 | 0 5 | = | 5 7 | |
| | | | | | | 45 11 | |

| WOODWORK. | | | | | | | |
|-----------------|-----|------|-----|-----|---|------|--|
| Top rails | 2/ | 34 6 | 0 6 | 0 4 | = | 11 6 | |
| Posts..... | 12/ | 4 0 | 0 6 | 0 6 | = | 12 0 | |
| Braces | 20/ | 7 6 | 0 6 | 0 3 | = | 18 9 | |
| | | | | | | 42 3 | |

| IRONWORK. | | | | | | | |
|--------------------------|-----|------|---------|---|---------|----|-------------------------|
| Top straps | 12/ | each | 8 lbs. | = | 96 lbs. | | |
| Forks | 12/ | „ | 13 lbs. | = | 156 | | |
| Screwed bolts and nuts . | 36/ | „ | 1 lb. | = | 36 | | |
| Rivettted ditto | 24/ | „ | 1 lb. | = | 24 | | |
| | | | | | 312 | or | Cwt. grs. lbs. 2 3 4 |

ABSTRACT.

| | | |
|------------------|-------------|--------|
| Excavation | Cubic Yards | 97 15 |
| Brickwork | „ „ | 329 15 |
| Stonework | Cubic Feet | 402 10 |
| Woodwork ... | „ „ | 42 3 |
| Ironwork | Cwt. | 2 3 4 |

| | | | | | | |
|----------|----|------|--------------------|-------------------|---|------------|
| ORK. | | | | | | |
| ..... | 4/ | 2 3 | 2 3 | 1 0 | = | 20 |
| ..... | 4/ | 6 6 | 1 11 | 1 0 | = | 49 1 |
| " | 4/ | 6 6 | 2 3 | 1 0 | = | 58 |
| " | 4/ | 5 6 | 2 7 $\frac{1}{2}$ | 1 0 | = | 57 |
| " | 4/ | 5 8 | 3 0 | 1 0 | = | 68 |
| ..... | 2/ | 28 9 | 3 9 | 1 0 | = | 215 |
| " | 4/ | 5 3 | 0 4 $\frac{1}{2}$ | 1 0 | = | 7 1 |
| ..... | 4/ | 2 6 | 3 3 | 1 0 | = | 32 |
| " | 2/ | 16 0 | 3 0 | 10 8 | = | 1024 |
| ..... | 4/ | 4 0 | 13 6 | 0 4 $\frac{1}{2}$ | = | 81 |
| " | 4/ | 5 0 | 4 6 | 0 7 $\frac{1}{2}$ | = | 56 |
| ..... | 4/ | 5 6 | 2 3 | 14 0 | = | 693 |
| " | 4/ | 5 6 | 1 10 $\frac{1}{2}$ | 11 0 | = | 453 |
| " | 4/ | 6 6 | 1 6 | 6 6 | = | 253 |
| " | 4/ | 6 6 | 1 2 | 2 8 | = | 80 1 |
| " | 4/ | 24 0 | 2 6 | 1 6 | = | 360 |
| | | | | | | <hr/> 3512 |
| ..... | 1/ | 34 0 | 31 8 | 1 6 | = | 1615 |
| ..... | 2/ | 4 6 | 6 4 | 31 8 | = | 1805 |
| ..... | 2/ | 20 3 | 2 4 | 1 6 | = | 141 |
| TS | 4/ | 4 0 | 4 0 | 1 2 | = | 74 |
| ..... | 2/ | 36 0 | 4 9 | 0 4 $\frac{1}{2}$ | = | 128 |
| WORK. | | | | | | |
| se | 2/ | 31 0 | 2 2 | 0 9 | = | 100 |
| " " | 4/ | 6 0 | 2 10 | 0 9 | = | 51 |
| | | | | | | <hr/> 151 |

BRICK BRIDGES.

STONEWORK—(continued.)

| | | | | | | Cubic Feet. |
|------------------------|----|------|------|-----|---|--------------|
| Coping over wing walls | 4/ | 22 0 | 1 10 | 0 3 | = | 40 4 |
| „ „ „ | 4/ | 1 10 | 1 10 | 0 5 | = | 5 7 |
| | | | | | | <u>45 11</u> |

WOODWORK.

| | | | | | | |
|----------------|-----|------|-----|-----|---|-------------|
| Top rails..... | 2/ | 34 6 | 0 6 | 0 4 | = | 11 6 |
| Posts | 12/ | 4 0 | 0 6 | 0 6 | = | 12 0 |
| Braces | 20/ | 7 6 | 0 6 | 0 3 | = | 18 9 |
| | | | | | | <u>42 3</u> |

IRONWORK.

| | | | | | |
|------------------------|-----|------|---------|---|---------------------|
| Top straps | 12/ | each | 8 lbs. | = | 96 lbs. |
| Forks | 12/ | „ | 13 lbs. | = | 156 |
| Screwed bolts and nuts | 24/ | „ | 1 lb. | = | 24 |
| „ „ „ | 12/ | „ | 1 lb. | = | 12 |
| Rivettted ditto..... | 24/ | „ | 1 lb. | = | 24 |
| | | | | | <u>312</u> or 2 3 4 |

ABSTRACT.

| | | |
|------------------|-------------|----------|
| Excavation | Cubic Yards | 96 15 0 |
| Brickwork | „ „ | 269 14 5 |
| Stonework | Cubic Feet | 402 10 |
| Woodwork | „ „ | 42 3 |
| Ironwork..... | Cwt. | 2 3 4 |

BRIDGE IN TWENTY-ONE FEET CUTTING. — (Plate No. 1.)

EXCAVATION.

| | | | | | | Cubic Feet. |
|----------------|----|------|------|-----|---|-------------------|
| Piers | 2/ | 35 4 | 5 0 | 8 0 | = | 2826 8 |
| Abutments..... | 2/ | 35 4 | 12 3 | 8 0 | = | 6925 4 |
| „ „ „ | 2/ | 35 4 | 11 0 | 6 0 | = | 4664 0 |
| | | | | | | <u>14436 0</u> or |

CONCRETE.

| | | | | | | |
|----------------|----|------|-----|-----|---|------------------|
| Piers | 2/ | 35 4 | 2 0 | 8 0 | = | 1130 8 |
| Abutments..... | 2/ | 35 4 | 2 0 | 8 0 | = | 1130 8 |
| | | | | | | <u>2261 4</u> or |

BRICK BRIDGES.

BRIDGE IN FOURTEEN FEET CUTTING. — (Plate No. 1.)

SAVATION.

| | | | | | Cubic Feet. | | Yds. Ft. In. |
|-------------|----|------|-----|-----|-------------|---------------|-------------------|
| nts | 4/ | 26 0 | 3 0 | 4 0 | = | 1248 0 | |
| „ „ | 2/ | 34 0 | 4 0 | 4 6 | = | 1224 0 | |
| forts | 4/ | 2 6 | 3 0 | 4 6 | = | 135 0 | |
| | | | | | | <u>2607 0</u> | or <u>96 15 0</u> |

CKWORK.

| | | | | | | | |
|-------------|----|------|-------|------|---|---------------|-------------------|
| nts | 4/ | 2 3 | 2 3 | 1 0 | = | 20 3 | |
| ..... | 4/ | 6 6 | 1 11 | 1 0 | = | 49 10 | |
| „ „ | 4/ | 6 6 | 2 3 | 1 0 | = | 58 6 | |
| „ „ | 4/ | 5 6 | 2 7½ | 1 0 | = | 57 9 | |
| „ „ | 4/ | 5 8 | 3 0 | 1 0 | = | 68 0 | |
| ..... | 2/ | 28 9 | 3 9 | 1 0 | = | 215 7½ | |
| „ „ | 4/ | 5 3 | 0 4½ | 1 0 | = | 7 10½ | |
| forts | 4/ | 2 6 | 3 3 | 1 0 | = | 32 6 | |
| „ „ | 2/ | 16 0 | 3 0 | 10 8 | = | 1024 0 | |
| ..... | 4/ | 4 0 | 13 6 | 0 4½ | = | 81 0 | |
| „ „ | 4/ | 5 0 | 4 6 | 0 7½ | = | 56 3 | |
| alls | 4/ | 5 6 | 2 3 | 14 0 | = | 693 0 | |
| „ „ | 4/ | 5 6 | 1 10½ | 11 0 | = | 453 9 | |
| „ „ | 4/ | 6 6 | 1 6 | 6 6 | = | 253 6 | |
| „ „ | 4/ | 6 6 | 1 2 | 2 8 | = | 80 11 | |
| „ „ | 4/ | 24 0 | 2 6 | 1 6 | = | 360 0 | |
| | | | | | | <u>3512 9</u> | or <u>130 2 9</u> |
| ..... | 1/ | 34 0 | 31 8 | 1 6 | = | 1615 0 | or <u>59 22 0</u> |
| ..... | 2/ | 4 6 | 6 4 | 31 8 | = | 1805 0 | or <u>66 23 0</u> |
| lls | 2/ | 20 3 | 2 4 | 1 6 | = | 141 9 | or <u>5 6 9</u> |
| piers | 4/ | 4 0 | 4 0 | 1 2 | = | 74 8 | or <u>2 20 8</u> |
| ..... | 2/ | 36 0 | 4 9 | 0 4½ | = | 128 3 | or <u>4 20 3</u> |

ONEWORK.

| | | | | | | | |
|--------------|----|------|------|------|---|--------------|--|
| course | 2/ | 31 0 | 2 2 | 0 9 | = | 100 9 | |
| „ „ | 4/ | 6 0 | 2 10 | 0 9 | = | 51 0 | |
| | | | | | | <u>151 9</u> | |
| ..... | 4/ | 4 6 | 1 5 | 0 4½ | = | 9 7 | |
| ..... | 2/ | 1 8 | 1 10 | 32 0 | = | 195 7 | |

| | | | | | | |
|----------------|-----|------|-----|-----|---|-------------|
| Top rails..... | 2/ | 34 6 | 0 6 | 0 4 | = | 11 6 |
| Posts | 12/ | 4 0 | 0 6 | 0 6 | = | 12 0 |
| Braces | 20/ | 7 6 | 0 6 | 0 3 | = | 18 9 |
| | | | | | | <u>42 3</u> |

| | | | | | | |
|------------------------|-----|------|---------|---|-----------|----------------|
| Top straps | 12/ | each | 8 lbs. | = | 96 lbs. | |
| Forks | 12/ | " | 13 lbs. | = | 156 | |
| Screwed bolts and nuts | 24/ | " | 1 lb. | = | 24 | |
| " " " | 12/ | " | 1 lb. | = | 12 | |
| Rivetted ditto..... | 24/ | " | 1 lb. | = | 24 | |
| | | | | | <hr/> 312 | |
| | | | | | | Cwt. qrs. lbs. |
| | | | | | or | 2 3 4 |

| | | | | |
|------------------|-------------|-----|-----|----|
| Excavation | Cubic Yards | 96 | 15 | 0 |
| Brickwork | ” ” | 269 | 14 | 5 |
| Stonework | Cubic Feet | | 402 | 10 |
| Woodwork | ” ” | | 42 | 3 |
| Ironwork..... | Cwt. | 2 | 3 | 4 |

| EXCAVATION. | | | | | | | Cubic Feet. | |
|----------------|----|----|---|----|---|---|-------------|----------|
| Piers | 2/ | 35 | 4 | 5 | 0 | 8 | 0 | = 2826 8 |
| Abutments..... | 2/ | 35 | 4 | 12 | 3 | 8 | 0 | = 6925 4 |
| " " " | 2/ | 35 | 4 | 11 | 0 | 6 | 0 | = 4664 0 |
| | | | | | | | | <hr/> |
| | | | | | | | | 14436 0 |

BRICK BRIDGES.

| BRICKWORK. | | | | | Cubic Feet. | Yds. Ft. In. | | |
|------------------------|------|-------|---------|------|-------------|--------------|----|----------|
| Piers | 2/ | 32 4 | 4 9 | 1 0 | = | 335 8 | | |
| " " " | 2/ | 31 8 | 13 0 | 4 0 | = | 3293 4 | | |
| Abutments..... | 2/ | 32 4 | 5 6 | 1 0 | = | 355 8 | | |
| " " " | 2/ | 31 8 | 8 6 | 4 0 | = | 2153 4 | | |
| Counterforts | 10/ | 2 3 | 0 4½ | 8 6 | = | 71 9 | | |
| | | | | | | 6209 9 | or | 229 26 9 |
| Arches | 3/ | 34 0 | 31 8 | 1 6 | = | 4845 0 | or | 179 12 0 |
| Backing..... | 6/ | 4 6 | 6 4 | 31 8 | = | 5415 0 | or | 200 15 0 |
| Spandrills | 6/ | 20 3 | 2 4 | 1 6 | = | 425 3 | or | 15 20 3 |
| Parapet piers..... | 8/ | 4 0 | 4 0 | 1 2 | = | 149 4 | or | 5 14 4 |
| Drains..... | 2/ | 47 8 | 4 9 | 0 4½ | = | 169 9 | or | 6 7 9 |
| STONework. | | | | | | | | |
| String-course..... | 2/ | 107 6 | 2 2 | 0 9 | = | 349 4 | | |
| " " " | 8/ | 6 0 | 2 10 | 0 9 | = | 102 0 | | |
| Copings | 8/ | 4 6 | 1 5 | 0 4½ | = | 19 2 | | |
| Imposts | 2/ | 4 6 | 1 8 | 32 0 | = | 480 0 | | |
| | | | | | | 950 6 | | |
| WOODWORK. | | | | | | | | |
| Top rails | 6/ | 31 0 | 0 6 | 0 4 | = | 31 0 | | |
| Posts | 36/ | 4 0 | 0 6 | 0 6 | = | 36 0 | | |
| Braces | 36/ | 7 6 | 0 6 | 0 3 | = | 33 9 | | |
| " " " | 24/ | 6 0 | 0 6 | 0 3 | = | 18 0 | | |
| | | | | | | 118 9 | | |
| IRONWORK. | | | | | | | | |
| Top straps | 36/ | each | 8 lbs. | = | 288 lbs. | | | |
| Forks..... | 36/ | „ | 13 lbs. | = | 468 | | | |
| Screwed bolts and nuts | 108/ | „ | 1 lb. | = | 108 | | | |
| Rivettèd ditto | 72/ | „ | 1 lb. | = | 72 | | | |
| | | | | | | 936 | or | 8 1 12 |
| | | | | | | | | |

ABSTRACT.

| | | |
|------------------|-------------|----------|
| Excavation | Cubic Yards | 534 18 0 |
| Concrete | „ „ | 83 20 4 |
| Brickwork..... | „ „ | 637 15 1 |
| Stonework | Cubic Feet | 950 6 |
| Woodwork | „ „ | 118 9 |
| Ironwork | Cwt. | 8 1 12 |

ЗК.

| | | | | | | |
|-------|-----|------|-----|-----|---|--------------|
| ..... | 4/ | 41 6 | 0 6 | 0 4 | = | 27 8 |
| „ | 2/ | 31 6 | 0 6 | 0 4 | = | 10 6 |
| ..... | 28/ | 4 0 | 0 6 | 0 6 | = | 28 0 |
| ..... | 44/ | 10 6 | 0 6 | 0 3 | = | 57 9 |
| | | | | | | <hr/> 123 11 |

К.

| | | | | | | |
|----------|-----|------|---------|---|-----------|---------------|
| ..... | 28/ | each | 8 lbs. | = | 224 lbs. | |
| ..... | 28/ | " | 13 lbs. | = | 364 | |
| and nuts | 84/ | " | 1 lb. | = | 84 | |
| ..... | 56/ | " | 1 lb. | = | 56 | |
| | | | | | <hr/> 728 | |
| | | | | | | Cwt. qrs. lb. |
| | | | | | or | 6 2 0 |

ABSTRACT.

| | | |
|------------------|-------------|----------|
| Excavation | Cubic Yards | 366 12 8 |
| Concrete | " " | 99 16 0 |
| Brickwork | " " | 530 23 7 |
| Stonework | Cubic Feet | 465 2 |
| Woodwork | " " | 123 11 |
| Ironwork | Cwt. | 6 2 0 |

BRIDGE IN FORTY FEET CUTTING. — (*Plate No. 2*

ATION.

| | | | | | | |
|-------|----|------|------|------|---|-------------|
| | | | | | | Cubic Feet. |
| ..... | 2/ | 14 0 | 35 2 | 12 3 | = | 12062 2 |
| ..... | 2/ | 8 0 | 35 2 | 6 0 | = | 3376 0 |
| " " | 2/ | 7 0 | 35 2 | 7 0 | = | 3446 4 |
| | | | | | | 19884 6 |

| | | | | | | | |
|------------------------|------|-------------|------|----------|---|----------|----|
| Abutments..... | 2/ | 4 10 | 33 0 | 1 0 | = | 319 0 | |
| " " " | 10/ | 3 9 | 2 7½ | 1 0 | = | 98 6 | |
| " " " | 2/ | 4 0 | 4 6 | 32 2 | = | 1158 0 | |
| " " " | 10/ | 3 9 | 8 6 | 1 10½ | = | 597 7 | |
| " " " | 6/ | 4 6 | 4 0 | 2 3 | = | 243 0 | |
| Piers | 2/ | 4 9 | 32 5 | 1 0 | = | 307 11 | |
| " " " | 2/ | 3 0 | 32 5 | 4 0 | = | 778 0 | |
| " " " | 2/ | 5 9 | 33 0 | 1 0 | = | 379 6 | |
| " " " | 2/ | 5 0 | 32 2 | 5 0 | = | 1608 4 | |
| " " " | 2/ | 4 3 | 31 8 | 18 0 | = | 4845 0 | |
| Arches | 3/ | 49 6 | 31 8 | 1 6 | = | 7053 9 | |
| " " " | 2/ | 40 0 | 31 8 | 1 6 | = | 3800 0 | |
| Backing | 2/ | 11 6 | 6 0 | 31 8 | = | 4370 0 | |
| Spandrills | 4/ | 16 0 | 4 6 | 1 6 | = | 432 0 | |
| Parapet piers | 8/ | 4 0 | 4 0 | 1 2 | = | 149 4 | |
| " " " | 4/ | 4 0 | 4 0 | 1 6 | = | 96 0 | |
| Drains | 2/ | 50 0 | 4 9 | 0 4½ | = | 178 0 | |
| | | | | | | 26415 11 | or |
| STONEWORK. | | | | | | | |
| String-course..... | 2/ | 175 6 | 2 2 | 0 9 | = | 570 4 | |
| " " " | 8/ | 6 0 | 2 10 | 0 9 | = | 102 0 | |
| " " " | 4/ | 6 0 | 3 2½ | 0 9 | = | 39 9 | |
| Corbels | 8/ | 1 0 | 1 3 | 3 0 | = | 30 0 | |
| Coping | 8/ | 4 6 | 1 5 | 0 4½ | = | 19 2 | |
| " " " | 4/ | 4 6 | 1 9 | 0 4½ | = | 11 10 | |
| | | | | | | 773 1 | |
| WOODWORK. | | | | | | | |
| Top rails..... | 10/ | 30 0 | 0 6 | 0 4 | = | 50 0 | |
| Posts | 60/ | 4 0 | 0 6 | 0 6 | = | 30 0 | |
| | | | | | | 80 0 | |
| IRONWORK. | | | | | | | |
| Top straps | 60/ | each 8 lbs. | = | 480 lbs. | | | |
| Forks | 60/ | „ 13 lbs. | = | 780 | | | |
| Screwed bolts and nuts | 120/ | „ 1 lb. | = | 120 | | | |

BRICK BRIDGES.

ABSTRACT.

| | | | | |
|------------------|-------------|-----|----|----|
| Excavation | Cubic Yards | 736 | 12 | 6 |
| Concrete | " " | 126 | 21 | 3 |
| Brickwork | " " | 941 | 8 | 11 |
| Stonework | Cubic Feet | 773 | 1 | |
| Woodwork | " " | 80 | 0 | |
| Ironwork..... | Cwt. | 13 | 1 | 16 |

BRIDGE IN FIFTY FEET CUTTING.—(Plate No. 3.)

EXCAVATION.

| | | | | | Cubic Feet. | Yds. Ft. In. |
|--------------|----|------|------|------|----------------|--------------------|
| utments..... | 4/ | 13 6 | 5 6 | 17 0 | = 5049 0 | |
| " " " | 2/ | 25 0 | 10 9 | 17 0 | = 9137 6 | |
| rs | 2/ | 7 0 | 5 9 | 35 2 | = 2830 11 | |
| " " " | 2/ | 8 0 | 5 9 | 35 8 | = 3281 4 | |
| | | | | | <u>20298 9</u> | or <u>751 21 9</u> |

CONCRETE.

| | | | | | | |
|---------------|----|------|------|------|---------------|-------------------|
| utments | 4/ | 10 6 | 5 8 | 2 0 | = 476 0 | |
| " " " | 2/ | 8 0 | 25 0 | 2 0 | = 800 0 | |
| rs | 2/ | 7 0 | 2 0 | 35 2 | = 984 8 | |
| " " " | 2/ | 8 0 | 2 0 | 35 8 | = 1141 4 | |
| | | | | | <u>3402 0</u> | or <u>126 0 0</u> |

BRICKWORK.

| | | | | | | |
|---------------|----|--------|------|------|-----------|--|
| utments | 2/ | 33 2 | 5 0 | 1 0 | = 331 8 | |
| " " " | 4/ | 16 10½ | 4 0 | 2 7½ | = 708 9 | |
| " " " | 4/ | 16 10½ | 4 0 | 2 3 | = 607 6 | |
| " " " | 2/ | 27 2 | 2 8 | 12 0 | = 1738 8 | |
| " " " | 6/ | 3 9 | 11 0 | 2 3 | = 556 10 | |
| 's | 2/ | 32 11 | 5 9 | 1 0 | = 378 6 | |
| " " " | 2/ | 32 5 | 5 0 | 1 0 | = 324 2 | |
| " " " | 2/ | 5 0 | 5 0 | 32 2 | = 1608 4 | |
| " " " | 2/ | 5 4 | 31 8 | 4 3 | = 1435 7 | |
| " " " | 4/ | 23 3½ | 4 3 | 4 7 | = 1814 10 | |
| " " " | 4/ | 23 3½ | 4 3 | 3 9 | = 1484 10 | |
| " " " | 2/ | 11 0 | 4 0 | 31 8 | = 2786 8 | |
| ies | 3/ | 49 6 | 31 8 | 1 6 | = 7053 9 | |
| " " " | 2/ | 44 0 | 31 8 | 1 6 | = 4180 0 | |
| ing | 4/ | 11 6 | 6 0 | 31 8 | = 8740 0 | |
| " " " | 2/ | 6 6 | 2 6 | 31 8 | = 1029 2 | |

BRICK BRIDGES.

BRICKWORK—(continued.)

| | | | | | | Cubic Feet. | |
|---------------------|-----|------|-----|------|---|-------------|----|
| Spandrills | 8/ | 16 0 | 5 6 | 1 6 | = | 1056 0 | |
| " " " | 2/ | 12 0 | 4 6 | 1 6 | = | 162 0 | |
| Parapet piers | 12/ | 4 0 | 4 0 | 1 2 | = | 224 0 | |
| " " " | 4/ | 4 0 | 4 0 | 1 6 | = | 96 0 | |
| Drains..... | 2/ | 51 6 | 4 9 | 0 4½ | = | 183 6 | |
| | | | | | | <hr/> | |
| | | | | | | 36500 9 | or |
| | | | | | | <hr/> | |

STONEWORK.

| | | | | | | | |
|---------------------|----|-------|------|------|---|-------|--|
| String-course | 2/ | 140 0 | 2 2 | 0 9 | = | 455 0 | |
| " " " | 8/ | 6 0 | 2 10 | 0 9 | = | 102 0 | |
| " " " | 4/ | 4 0 | 2 10 | 0 9 | = | 34 0 | |
| " " " | 4/ | 6 0 | 3 2½ | 0 9 | = | 57 9 | |
| Corbels | 8/ | 1 0 | 1 3 | 3 0 | = | 30 0 | |
| Coping | 8/ | 4 6 | 1 5 | 0 4½ | = | 18 1 | |
| " " " | 4/ | 4 6 | 1 9½ | 0 4½ | = | 12 1 | |
| " " " | 4/ | 4 0 | 1 5 | 0 4½ | = | 8 6 | |
| | | | | | | <hr/> | |
| | | | | | | 717 5 | |
| | | | | | | <hr/> | |

WOODWORK.

| | | | | | | | |
|-----------------|-----|------|-----|-----|---|-------|--|
| Top rails | 10/ | 31 6 | 0 4 | 0 6 | = | 52 6 | |
| Posts | 60/ | 4 0 | 0 6 | 0 6 | = | 60 0 | |
| Braces | 60/ | 7 9 | 0 6 | 0 3 | = | 58 1 | |
| " " " | 40/ | 5 9 | 0 6 | 0 3 | = | 28 9 | |
| | | | | | | <hr/> | |
| | | | | | | 199 4 | |
| | | | | | | <hr/> | |

IRONWORK.

| | | | | | | |
|------------------------|------|------|---------|---|----------------|--|
| Top straps | 60/ | each | 8 lbs. | = | 480 lbs. | |
| Forks | 60/ | " | 13 lbs. | = | 780 | |
| Screwed bolts and nuts | 120/ | " | 1 lb. | = | 120 | |
| " " " | 60/ | " | 1 lb. | = | 60 | |
| Rivetted ditto | 120/ | " | 1 lb. | = | 120 | |
| | | | | | <hr/> | |
| | | | | | 1560 | |
| | | | | | or | |
| | | | | | Cwt. qrs. lbs. | |
| | | | | | 13 3 20 | |
| | | | | | <hr/> | |

ABSTRACT.

| | | |
|------------------|-------------|-----------|
| Excavation | Cubic Yards | 751 21 9 |
| Concrete | " " | 126 0 0 |
| Brickwork | " " | 1351 23 9 |
| Stonework | Cubic Feet | 717 5 |
| Woodwork..... | " " | 199 4 |
| Ironwork | Cwt. | 13 3 20 |

| | | | | | | |
|---|----|-----|------|-----|---|---------------|
| " | 2/ | 7 6 | 35 2 | 6 6 | = | 3428 9 |
| " | 2/ | 8 0 | 35 2 | 7 6 | = | 4220 0 |
| | | | | | | <hr/> 24685 8 |

TE.

| | | | | | | |
|-------|----|------|------|-----|---|--------------|
| ..... | 2/ | 35 2 | 9 0 | 2 0 | = | 1246 0 |
| " | 4/ | 7 6 | 4 6 | 2 0 | = | 270 0 |
| " | 4/ | 1 6 | 3 0 | 4 6 | = | 81 0 |
| ..... | 2/ | 7 0 | 35 2 | 2 0 | = | 984 8 |
| " | 2/ | 7 6 | 35 2 | 2 0 | = | 1055 0 |
| " | 2/ | 8 0 | 35 2 | 2 0 | = | 1125 4 |
| | | | | | | <hr/> 4762 0 |

WORK.

| | | | | | | |
|-------|-----|------|------|------|---|---------|
| ..... | 2/ | 6 9 | 33 0 | 1 0 | = | 445 6 |
| " | 4/ | 2 3 | 7 6 | 1 0 | = | 67 6 |
| " | 2/ | 31 8 | 6 0 | 5 3 | = | 1995 0 |
| " | 4/ | 7 6 | 1 6 | 2 0 | = | 90 0 |
| ..... | 2/ | 4 9 | 32 5 | 1 0 | = | 244 1 |
| " | 2/ | 5 3 | 32 5 | 1 0 | = | 340 4 |
| " | 2/ | 5 9 | 32 5 | 1 0 | = | 372 9 |
| " | 2/ | 2 0 | 4 0 | 31 8 | = | 506 8 |
| " | 2/ | 12 0 | 31 8 | 4 3 | = | 3230 0 |
| " | 4/ | 4 4 | 4 3 | 9 6 | = | 699 10 |
| " | 4/ | 4 0 | 4 3 | 9 6 | = | 665 0 |
| " | 2/ | 6 0 | 5 0 | 32 2 | = | 1930 0 |
| " | 2/ | 5 6 | 4 3 | 31 8 | = | 1504 2 |
| " | 4/ | 4 4 | 4 3 | 33 6 | = | 2467 10 |
| " | 4/ | 4 0 | 4 3 | 33 6 | = | 2345 0 |
| ..... | 5/ | 50 0 | 31 8 | 1 6 | = | 11875 0 |
| " | 2/ | 31 0 | 31 8 | 1 6 | = | 2945 0 |
| ..... | 6/ | 8 0 | 8 6 | 31 8 | = | 12920 0 |
| ..... | 12/ | 14 6 | 5 0 | 1 6 | = | 1305 0 |

| | | | | | | |
|-----------------|-----|------|-----|-----|---|-------|
| | | | | | | 924 3 |
| WOODWORK. | | | | | | |
| Top rails | 14/ | 31 6 | 0 6 | 0 4 | = | 73 6 |
| Posts | 84/ | 4 0 | 0 6 | 0 6 | = | 84 0 |
| Braces | 84/ | 8 0 | 0 6 | 0 3 | = | 84 0 |
| " " " | 56/ | 5 6 | 0 6 | 0 3 | = | 38 6 |
| | | | | | | 280 0 |

| | | | | | | |
|------------------------|------|------|---------|---|----------|-------------------|
| IRONWORK. | | | | | | |
| Top straps | 84/ | each | 8 lbs. | = | 672 lbs. | |
| Forks | 84/ | " | 13 lbs. | = | 1092 | |
| Screwed bolts and nuts | 168/ | " | 1 lb. | = | 168 | |
| " " " | 84/ | " | 1 lb. | = | 84 | |
| Rivettted ditto | 168/ | " | 1 lb. | = | 168 | |
| | | | | | 2184 | or Cwt. qrs. lbs. |
| | | | | | | 19 2 0 |

| | | | | |
|------------------|-------------|------|----|----|
| ABSTRACT. | | | | |
| Excavation | Cubic Yards | 914 | 7 | 8 |
| Concrete | " " | 176 | 10 | 0 |
| Brickwork | " " | 1727 | 9 | 11 |
| Stonework | Cubic Feet | 924 | 3 | |
| Woodwork | " " | 280 | 0 | |
| Ironwork | Cwt. | 19 | 2 | 0 |

BRIDGE IN SEVEN FEET EMBANKMENT.—(Plate No. 5.)

| | | | | | | |
|-----------------|----|------|------|-----|---|-------------|
| EXCAVATION. | | | | | | Cubic Feet. |
| Abutments | 2/ | 8 0 | 35 0 | 6 0 | = | 3360 0 |
| Wing walls..... | 4/ | 23 0 | 5 6 | 4 0 | = | 2024 0 |

BRICK BRIDGES.

| CKWORK. | | | | | | Cubic Feet. | Yds. Ft. In. | |
|------------|----|------|-------|-------|---|-------------|--------------|----------|
| nts..... | 2/ | 3 9 | 32 9 | 1 0 | = | 245 7 | | |
| " " | 6/ | 4 0 | 3 0 | 1 0 | = | 72 0 | | |
| " " | 4/ | 5 6 | 3 0 | 1 0 | = | 66 0 | | |
| " " | 4/ | 5 0 | 0 4½ | 1 0 | = | 7 6 | | |
| " " | 4/ | 5 6 | 2 7½ | 1 0 | = | 57 9 | | |
| " " | 4/ | 14 0 | 2 3 | 1 0 | = | 126 0 | | |
| " " | 4/ | 2 9 | 2 9 | 1 0 | = | 30 3 | | |
| " " | 2/ | 3 0 | 32 0 | 17 6 | = | 3360 0 | | |
| " " | 4/ | 4 6 | 5 0 | 0 4½ | = | 16 10 | | |
| " " | 4/ | 4 0 | 14 0 | 0 4½ | = | 84 0 | | |
| " " | 4/ | 5 6 | 2 3 | 11 0 | = | 544 6 | | |
| " " | 4/ | 5 6 | 1 10½ | 10 0 | = | 412 6 | | |
| " " | 4/ | 14 0 | 1 6 | 9 0 | = | 756 0 | | |
| " " | 4/ | 2 0 | 2 0 | 5 6 | = | 88 0 | | |
| " " | 6/ | 4 0 | 2 3 | 7 6 | = | 405 0 | | |
| ..... | 1/ | 35 0 | 31 8 | 1 10½ | = | 2078 1 | | |
| ls | 2/ | 6 6 | 5 0 | 1 6 | = | 97 6 | | |
| piers..... | 4/ | 4 0 | 4 0 | 1 2 | = | 74 8 | | |
| ..... | 2/ | 52 0 | 4 9 | 0 4½ | = | 185 3 | | |
| | | | | | | 8707 5 | or | 322 13 5 |

| NEWORK. | | | | | | |
|-----------|----|------|------|------|---|--------|
| urse..... | 2/ | 31 0 | 2 2 | 0 9 | = | 100 9 |
| " " | 4/ | 6 0 | 2 10 | 0 9 | = | 51 0 |
| ..... | 4/ | 4 6 | 1 5 | 0 4½ | = | 9 7 |
| " " | 4/ | 2 0 | 24 0 | 0 3 | = | 48 0 |
| " " | 4/ | 2 6 | 2 6 | 0 6 | = | 12 6 |
| ..... | 2/ | 2 0 | 2 0 | 32 0 | = | 256 0 |
| | | | | | | 477 10 |

| ODWORK. | | | | | | |
|---------|-----|------|-----|-----|---|------|
| ..... | 2/ | 34 6 | 0 6 | 0 4 | = | 11 6 |
| ..... | 12/ | 4 0 | 0 6 | 0 6 | = | 12 0 |
| ..... | 20/ | 7 6 | 0 6 | 0 6 | = | 18 9 |
| | | | | | | 42 3 |

| NWORK. | | | | | | |
|----------------|-----|-------------|---|----------------|--|--|
| ps | 12/ | each 8 lbs. | = | 96 lbs. | | |
| ..... | 12/ | " 13 lbs. | = | 156 | | |
| bolts and nuts | 24/ | " 1 lb. | = | 24 | | |
| " " | 12/ | " 1 lb. | = | 12 | | |
| ditto | 24/ | " 1 lb. | = | 24 | | |
| | | | | Cwt. qrs. lbs. | | |
| | | | | 312 or 2 3 4 | | |

BRIDGE IN FOURTEEN FEET EMBANKMENT. — (Plate A

EXCAVATION.

| | | | | Cubic Feet. | |
|-----------------|----|------|------|-------------|---------------|
| abutments | 2/ | 8 0 | 35 0 | 4 0 | = 2240 0 |
| " " " | 4/ | 23 0 | 5 6 | 4 0 | = 2024 0 |
| | | | | | <u>4264 0</u> |

CONCRETE.

| | | | | | |
|-----------------|----|------|------|-----|---------------|
| abutments | 2/ | 8 0 | 35 0 | 2 0 | = 1120 0 |
| " " " | 4/ | 23 0 | 5 6 | 2 0 | = 1012 0 |
| | | | | | <u>2132 0</u> |

BRICKWORK.

| | | | | | |
|------------------|----|------|-------|-------|----------|
| Abutments | 2/ | 3 9 | 32 9 | 1 0 | = 245 7 |
| " " " | 6/ | 4 0 | 3 0 | 1 0 | = 72 0 |
| " " " | 4/ | 5 6 | 3 0 | 1 0 | = 66 0 |
| " " " | 4/ | 5 0 | 0 4½ | 1 0 | = 7 6 |
| " " " | 4/ | 5 6 | 2 7½ | 1 0 | = 57 9 |
| " " " | 4/ | 14 0 | 2 3 | 1 0 | = 126 0 |
| " " " | 4/ | 2 9 | 2 9 | 1 0 | = 30 3 |
| Wing walls | 2/ | 3 0 | 32 0 | 17 6 | = 3360 0 |
| " " " | 4/ | 4 6 | 5 0 | 0 4½ | = 16 10 |
| " " " | 4/ | 4 0 | 0 4½ | 14 0 | = 84 0 |
| Abutments | 4/ | 5 6 | 2 3 | *15 6 | = 767 3 |
| " " " | 4/ | 5 6 | 1 10½ | *14 6 | = 598 1 |
| " " " | 4/ | 14 0 | 1 6 | *13 6 | = 1134 0 |
| " " " | 4/ | 2 0 | 2 0 | *10 0 | = 160 0 |
| " " " | 6/ | 4 0 | 2 3 | *12 6 | = 675 0 |
| Arch | 1/ | 35 0 | 31 8 | 1 10½ | = 2078 1 |
| | | | 5 0 | 1 6 | = 97 6 |

| | | | | | | |
|-------|-----|-------------|-----|------------|----------------|---------------|
| | 4/ | 2 6 | 2 6 | 0 0 | = | 0 0 |
| .. | 2/ | 2 0 | 2 0 | 32 0 | = | 256 0 |
| | | | | | | <u>477 10</u> |
| ... | 2/ | 34 6 | 0 6 | 0 4 | = | 11 6 |
| ... | 12/ | 4 0 | 0 6 | 0 6 | = | 12 0 |
| ... | 20/ | 7 6 | 0 6 | 0 3 | = | 18 9 |
| | | | | | | <u>42 3</u> |
| ..... | 12/ | each 8 lbs. | = | 96 lbs. | | |
| ..... | 12/ | „ 13 lbs. | = | 156 | | |
| ..... | 24/ | „ 1 lb. | = | 24 | | |
| ..... | 12/ | „ 1 lb. | = | 12 | | |
| ..... | 24/ | „ 1 lb. | = | 24 | | |
| | | | | <u>312</u> | Cwt. qrs. lbs. | |
| | | | | | or 2 3 4 | |

ABSTRACT.

| | | |
|------------------|-------------|----------|
| Excavation | Cubic Yards | 157 25 0 |
| Concrete | „ „ | 78 26 0 |
| Brickwork..... | „ „ | 364 7 9 |
| Stonework | Cubic Feet | 477 10 |
| Woodwork | „ „ | 42 3 |
| Ironwork | Cwt. | 2 3 4 |

BRIDGE IN NINETEEN FEET EMBANKMENT. — (Plate N

quantities in this Bridge are the same as in the Fourteen Feet Embankmen
 * on page 17 The following Abstract will therefo

| | | | | | | | | |
|----------------|----|-------|-------------------|--------------------|---|-----------------|----|------------|
| | | | | | | <u>6484 0</u> | or | <u>24</u> |
| CONCRETE. | | | | | | | | |
| ments | 2/ | 13 6 | 35 2 | 2 0 | = | 1899 0 | | |
| " " " | 4/ | 6 0 | 6 0 | 2 0 | = | 288 0 | | |
| ..... | 2/ | 7 6 | 35 2 | 2 0 | = | 1055 0 | | |
| | | | | | | <u>3242 0</u> | or | <u>12</u> |
| BRICKWORK. | | | | | | | | |
| ments | 2/ | 6 5 | 33 0 | 1 0 | = | 423 6 | | |
| " " " | 6/ | 3 0 | 4 6 | 1 0 | = | 81 0 | | |
| " " " | 4/ | 10 8 | 3 0 | 1 0 | = | 128 0 | | |
| " " " | 2/ | 25 0 | 5 0 | 31 8 | = | 7916 8 | | |
| " " " | 4/ | 10 8 | 31 0 | 2 3 | = | 2976 0 | | |
| terforts | 6/ | 2 3 | 4 6 | 23 0 | = | 1397 3 | | |
| ..... | 2/ | 5 3 | 33 0 | 1 0 | = | 346 6 | | |
| " " " | 2/ | 5 0 | 4 6 | 32 2 | = | 1447 6 | | |
| " " " | 2/ | 8 0 | 31 8 | 4 0 | = | 2026 8 | | |
| es | 3/ | 52 0 | 31 8 | 1 10 $\frac{1}{2}$ | = | 9262 6 | | |
| ng | 2/ | 9 0 | 6 6 | 31 8 | = | 3705 0 | | |
| drills | 4/ | 15 0 | 4 6 | 1 10 $\frac{1}{2}$ | = | 506 3 | | |
| " " " | 2/ | 20 0 | 6 6 | 1 10 $\frac{1}{2}$ | = | 487 6 | | |
| et piers | 8/ | 4 0 | 4 0 | 1 2 | = | 149 4 | | |
| " " " | 4/ | 4 0 | 4 0 | 1 6 | = | 96 0 | | |
| is | 2/ | 52 0 | 4 9 | 0 4 $\frac{1}{2}$ | = | 185 3 | | |
| | | | | | | <u>31134 11</u> | or | <u>115</u> |
| STONework. | | | | | | | | |
| g-course | 2/ | 126 0 | 2 2 | 0 9 | = | 409 6 | | |
| " " " | 4/ | 6 0 | 2 10 | 0 9 | = | 51 0 | | |
| " " " | 4/ | 4 0 | 2 10 | 0 9 | = | 34 0 | | |
| " " " | 4/ | 6 0 | 3 2 $\frac{1}{2}$ | 0 9 | = | 57 9 | | |
| als | 4/ | 1 0 | 1 3 | 3 0 | = | 15 0 | | |

BRICK BRIDGES.

WOODWORK.

| | | | | | | Cubic Feet. |
|-------------|-----|----|---|---|---|-------------|
| rails | 4/ | 36 | 0 | 0 | 6 | 0 4 = 24 0 |
| " " " | 2/ | 30 | 0 | 0 | 6 | 0 4 = 10 0 |
| ..... | 40/ | 4 | 0 | 0 | 6 | 0 6 = 40 0 |
| | | | | | | <u>74 0</u> |

IRONWORK.

| | | | | | | |
|--------------------|------|------|---------|-------------|----------|--|
| straps | 60/ | each | 8 lbs. | = | 480 lbs. | |
| s | 60/ | " | 13 lbs. | = | 780 | |
| wed bolts and nuts | 120/ | " | 1 lb. | = | 120 | |
| tted ditto | 120/ | " | 1 lb. | = | 120 | |
| | | | | <u>1500</u> | or | <u>Cwt. qr. lbs.</u> <u>13 1 16</u> |

ABSTRACT.

| | | | | |
|------------------|-------------|------|---|----|
| Excavation | Cubic Yards | 240 | 4 | 0 |
| Concrete | " " | 120 | 2 | 0 |
| Brickwork | " " | 1153 | 3 | 11 |
| Stonework | Cubic Feet | 597 | 5 | |
| Woodwork | " " | 74 | 0 | |
| Ironwork | Cwt. | 13 | 1 | 16 |

TUNNEL-BRIDGE IN THIRTY FEET EMBANKMENT.—(Plate No. 6.)

EXCAVATION.

| | | | | | | Cubic Feet. | Yds. Ft. In. |
|---------------|-----|----|----|----|---|---------------|--------------------|
| utments | 2/ | 4 | 7½ | 67 | 0 | 4 0 = 2479 0 | |
| " " " | 10/ | 4 | 6 | 5 | 3 | 4 0 = 945 0 | |
| ng walls..... | 4/ | 46 | 0 | 5 | 6 | 4 0 = 4046 0 | |
| | | | | | | <u>7472 0</u> | or <u>276 20 0</u> |

CONCRETE.

| | | | | | | | |
|---------------|-----|----|----|----|---|---------------|--------------------|
| utments | 2/ | 4 | 7½ | 67 | 0 | 2 0 = 1239 6 | |
| " " " | 10/ | 4 | 6 | 5 | 3 | 2 0 = 472 6 | |
| ng walls..... | 4/ | 46 | 0 | 5 | 6 | 2 0 = 2024 0 | |
| | | | | | | <u>3736 0</u> | or <u>138 10 0</u> |

BRICKWORK.

| | | | | | | | |
|---------------|-----|----|----|----|----|--------------|--|
| utments | 2/ | 2 | 7½ | 64 | 0 | 1 0 = 336 0 | |
| " " " | 10/ | 4 | 0 | 3 | 0 | 1 0 = 120 0 | |
| " " " | 4/ | 5 | 3 | 3 | 4½ | 1 0 = 70 10½ | |
| " " " | 4/ | 10 | 6 | 3 | 0 | 1 0 = 126 0 | |
| " " " | 4/ | 11 | 6 | 2 | 7½ | 1 0 = 120 0 | |

| | | | | | | | | |
|------------------|---|---|----|-------|-------|------|---|---------|
| " | " | " | 2/ | 10 0 | 2 3 | 20 6 | = | 1845 0 |
| " | " | " | 4/ | 1 10½ | 1 10½ | 2 6 | = | 35 2 |
| " | " | " | 4/ | 5 6 | 2 7½ | 21 0 | = | 1212 9 |
| " | " | " | 4/ | 6 0 | 5 0 | 1 6 | = | 90 0 |
| Spandrills | | | 2/ | 152 0 | 4 9 | 0 4½ | = | 541 6 |
| Drains..... | | | 2/ | | | | | |
| | | | | | | | | <hr/> |
| | | | | | | | | 14713 4 |

STONEMWORK.

| | | | | | | |
|---------------------|----|------|-------|-----|---|-------------|
| String-course | 2/ | 25 0 | 3 6 | 0 9 | = | 131 3 |
| " " " | 4/ | 12 0 | 3 10½ | 0 9 | = | 139 6 |
| " " " | 2/ | 27 0 | 2 6 | 0 9 | = | 101 3 |
| " " " | 4/ | 4 0 | 2 10½ | 0 6 | = | 23 0 |
| | | | | | | <hr/> 395 0 |

ABSTRACT.

| | | | | |
|-------------------------|--------------------|------------|------------|----------|
| Excavation | Cubic Yards | 276 | 20 | 0 |
| Concrete | ” ” | 138 | 10 | 0 |
| Brickwork | ” ” | 544 | 25 | 0 |
| Stonework | Cubic Feet | | 395 | 0 |

BRIDGE IN FORTY FEET EMBANKMENT.—(Plate A)

EXCAVATION.

| EXCAVATION. | | | | | | Cubic Feet. |
|----------------|----|------|------|-----|-----|---------------|
| Abutments..... | 2/ | 14 9 | 35 5 | 4 0 | = | 4179 2 |
| Piers | 2/ | 7 3 | 35 2 | 4 0 | } = | 4360 8 |
| „ „ „ | 2/ | 7 9 | 35 2 | 4 0 | | |
| | | | | | | <hr/> 8539 10 |

BRICK BRIDGES.

CKWORK.

| | | | | | Cubic Feet. | | Yds. Ft. In. |
|-------------|-----|-------|-------|-------|-------------|---------|--------------|
| 1ts | 2/ | 8 9 | 32 5 | 1 0 | = | 567 3 | |
| " " | 4/ | 4 9 | 0 4½ | 1 0 | = | 7 2 | |
| " " | 10/ | 3 9 | 3 9 | 1 0 | = | 140 7 | |
| " " | 2/ | 6 6 | 31 8 | 35 0 | = | 14408 4 | |
| " " | 10/ | 32 6 | 3 0 | 3 9 | = | 3656 3 | |
| ..... | 2/ | 5 6 | 32 11 | 1 0 | = | 362 1 | |
| " " | 2/ | 5 0 | 32 5 | 1 0 | = | 324 2 | |
| " " | 2/ | 5 0 | 4 9 | 32 2 | = | 1527 11 | |
| " " | 2/ | 5 7½ | 4 1½ | 31 8 | = | 1469 7 | |
| " " | 4/ | 3 9 | 4 1½ | 12 6 | = | 773 5 | |
| " " | 4/ | 4 7 | 4 1½ | 12 6 | = | 945 4 | |
| " " | 2/ | 10 7½ | 4 1½ | 31 8 | = | 2775 9 | |
| " " | 4/ | 4 7 | 4 1½ | 12 6 | = | 945 4 | |
| " " | 4/ | 3 9 | 4 1½ | 12 6 | = | 773 5 | |
| ..... | 5/ | 52 0 | 31 8 | 1 10½ | = | 15437 6 | |
| ..... | 4/ | 9 0 | 6 6 | 31 8. | = | 7410 0 | |
| ls | 8/ | 15 0 | 4 6 | 1 10½ | = | 1012 6 | |
| " " | 2/ | 20 0 | 6 6 | 1 10½ | = | 487 6 | |
| piers | 12/ | 4 0 | 4 0 | 1 2 | = | 224 0 | |
| " " | 4/ | 4 0 | 4 0 | 1 6 | = | 96 0 | |
| ..... | 2/ | 52 0 | 4 9 | 0 4½ | = | 185 3 | |

53527 4 or 1982 13 4

NEWORK.

| | | | | | | |
|-------------|----|-------|------|------|---|-------|
| curse | 2/ | 140 0 | 2 2 | 0 9 | = | 237 6 |
| " " | 8/ | 6 0 | 2 10 | 0 9 | = | 102 0 |
| " " | 4/ | 4 0 | 2 10 | 0 9 | = | 34 0 |
| " " | 4/ | 6 0 | 3 2½ | 0 9 | = | 57 9 |
| ..... | 8/ | 1 0 | 1 3 | 3 0 | = | 30 0 |
| ..... | 8/ | 4 6 | 1 5 | 0 4½ | = | 19 1½ |
| " " | 4/ | 4 6 | 1 9½ | 0 4½ | = | 12 1 |
| " " | 4/ | 4 0 | 1 5 | 0 4½ | = | 8 6 |

500 11½

ODWORK.

| | | | | | | |
|---------|-----|------|-----|-----|---|-------|
| 3 | 10/ | 31 6 | 0 4 | 0 6 | = | 52 6 |
| ..... | 60/ | 4 0 | 0 6 | 0 6 | = | 60 0 |
| ..... | 60/ | 7 9 | 0 6 | 0 3 | = | 58 1½ |
| " " | 40/ | 5 9 | 0 6 | 0 3 | = | 28 9 |

199 4½

NWORK.

| | | | | |
|----------|-----|-------------|---|----------|
| ps | 60/ | each 8 lbs. | = | 480 lbs. |
| ..... | 60/ | " 13 lbs. | = | 780 |

BRICK BRIDGES.

IRONWORK—(continued.)

| | | | | | |
|------------------------|------|------|---------|----------|----------------|
| Screwed bolts and nuts | 120/ | each | 1 lb. = | 120 lbs. | |
| „ „ „ | 60/ | „ | 1 lb. = | 60 | |
| Rivetted ditto..... | 120/ | „ | 1 lb. = | 120 | |
| | | | | <hr/> | Cwt. qrs. lbs. |
| | | | | 1560 | or 13 3 20 |
| | | | | <hr/> | |

ABSTRACT.

| | | | | |
|------------------|-------------|------|-----|----|
| Excavation | Cubic Yards | 316 | 7 | 10 |
| Concrete | „ „ | 158 | 3 | 11 |
| Brickwork | „ „ | 1982 | 13 | 4 |
| Stonework | Cubic Feet | 500 | 11½ | |
| Woodwork | „ „ | 199 | 4½ | |
| Ironwork | Cwt. | 13 | 3 | 20 |

BRIDGE IN FIFTY FEET EMBANKMENT. — (Plate No. 8.

EXCAVATION.

| | | | | | |
|-----------------|----|------|------|-----|-------------|
| | | | | | Cubic Feet. |
| Abutments | 2/ | 15 6 | 34 0 | 4 0 | = 4216 0 |
| Piers | 2/ | 8 0 | 34 0 | 4 0 | = 2176 0 |
| „ „ „ | 2/ | 7 7 | 34 0 | 4 0 | = 2062 8 |
| | | | | | <hr/> |
| | | | | | 8454 8 or |
| | | | | | <hr/> |

CONCRETE.

| | | | | | |
|-----------------|----|------|------|-----|-----------|
| Abutments | 2/ | 15 6 | 34 0 | 2 0 | = 2108 0 |
| Piers | 2/ | 8 0 | 34 0 | 2 0 | = 1088 0 |
| „ „ „ | 2/ | 7 7 | 34 0 | 2 0 | = 1031 4 |
| | | | | | <hr/> |
| | | | | | 4227 4 or |
| | | | | | <hr/> |

BRICKWORK.

| | | | | | |
|-----------------|-----|-------|-------|------|-----------|
| Abutments | 2/ | 9 6 | 32 5 | 1 0 | = 615 11 |
| „ „ „ | 10/ | 3 9 | 3 9 | 1 0 | = 140 7 |
| „ „ „ | 2/ | 6 9 | 46 0 | 31 8 | = 19665 0 |
| „ „ „ | 10/ | 3 9 | 3 0 | 43 6 | = 4893 0 |
| Piers | 2/ | 5 9 | 32 11 | 1 0 | = 378 6 |
| „ „ „ | 2/ | 5 4 | 32 5 | 1 0 | = 345 10 |
| „ „ „ | 2/ | 5 0 | 5 0 | 32 2 | = 1608 4 |
| „ „ „ | 2/ | 5 7½ | 4 3 | 31 8 | = 1514 1 |
| „ „ „ | 2/ | 10 7½ | 4 3½ | 31 8 | = 2884 7 |
| „ „ „ | 4/ | 4 7 | 22 6 | 4 3 | = 1661 6 |
| „ „ „ | 4/ | 3 9 | 22 6 | 4 3 | = 1269 4 |

| | | | | | |
|--------|------|-----|------|---|---------------------|
| .. 12/ | 4 0 | 4 0 | 0 4½ | = | 185 5 |
| .. 2/ | 52 0 | 4 9 | | | |
| | | | | | <u>61774 5</u> or 2 |

| | | | | | |
|----------|-------|------|------|---|--------------|
| 2/ | 140 0 | 2 2 | 0 9 | = | 455 0 |
| 12/ | 6 0 | 2 10 | 0 9 | = | 153 0 |
| 12/ | 1 3 | 1 0 | 3 0 | = | 45 0 |
| 12/ | 4 6 | 1 5 | 0 4½ | = | 28 8 |
| | | | | | <u>681 8</u> |

| | | | | | |
|-----------|------|-----|-----|---|--------------|
| 10/ | 31 6 | 0 6 | 0 4 | = | 52 6 |
| 60/ | 4 0 | 0 6 | 0 6 | = | 60 0 |
| 60/ | 8 0 | 0 6 | 0 3 | = | 60 0 |
| 40/ | 5 6 | 0 6 | 0 3 | = | 27 6 |
| ” | | | | | <u>200 0</u> |

| | | | |
|------------|-------------|---|---|
| 60/ | each 8 lbs. | = | 480 lbs. |
| 60/ | ” 13 lbs. | = | 780 |
| 120/ | ” 1 lb. | = | 120 |
| 60/ | ” 1 lb. | = | 60 |
| 120/ | ” 1 lb. | = | 120 |
| | | | <u>1560</u> or <u>Cwt. qrs. lbs.</u> 13 3 20 |

ABSTRACT.

| | | |
|------------------|-------------|-----------|
| Excavation | Cubic Yards | 313 3 8 |
| Concrete | ” ” | 156 15 4 |
| Brickwork..... | ” ” | 2287 25 5 |
| | Cubic Feet | 681 8 |

| | | | | | | | | | | |
|---------------|-----|------|--------|----|----------|-------|--------|-------|----|----|
| CONCRETE. | | | | | | | 11605 | 0 | or | 4 |
| ents | 2/ | 35 | 2 | 17 | 3 | 2 0 | = | 2426 | 6 | |
| ..... | 6/ | 35 | 2 | 8 | 0 | 2 0 | = | 3376 | 0 | |
| | | | | | | | 5802 | 6 | or | 2 |
| BRICKWORK. | | | | | | | | | | |
| ents | 2/ | 11 | 6 | 33 | 0 | 1 0 | = | 759 | 0 | |
| " " | 10/ | 3 | 0 | 3 | 6 | 1 0 | = | 105 | 0 | |
| " " | 2/ | 53 | 0 | 8 | 10 | 31 8 | = | 29650 | 7 | |
| " " | 10/ | 3 | 6 | 3 | 0 | 61 0 | = | 6405 | 0 | |
| ..... | 6/ | 5 | 9 | 33 | 0 | 1 0 | = | 1138 | 6 | |
| " " | 6/ | 43 | 1½ | 4 | 3 | 31 8 | = | 34823 | 6 | |
| ..... | 7/ | 50 | 0 | 31 | 8 | 1 10½ | = | 20781 | 3 | |
| g | 6/ | 10 | 6 | 6 | 0 | 31 8 | = | 11970 | 0 | |
| ills | 12/ | 4 | 6 | 14 | 0 | 1 10½ | = | 1417 | 6 | |
| t piers | 12/ | 4 | 0 | 4 | 0 | 1 2 | = | 224 | 0 | |
| " " | 4/ | 4 | 0 | 4 | 0 | 1 6 | = | 96 | 0 | |
| ..... | 2/ | 52 | 0 | 4 | 9 | 0 4½ | = | 185 | 5 | |
| | | | | | | | 107555 | 9 | or | 39 |
| STONEWORK. | | | | | | | | | | |
| course | 2/ | 250 | 0 | 2 | 2 | 0 9 | = | 812 | 6 | |
| " " | 16/ | 6 | 0 | 2 | 10 | 0 9 | = | 204 | 0 | |
| " | 12/ | 1 | 3 | 1 | 0 | 3 0 | = | 45 | 0 | |
| " | 12/ | 4 | 6 | 1 | 5 | 0 4½ | = | 28 | 8 | |
| " " | 4/ | 4 | 6 | 1 | 9½ | 0 4½ | = | 12 | 1 | |
| | | | | | | | 1102 | 3 | | |
| WOODWORK. | | | | | | | | | | |
| ils | 14/ | 31 | 0 | 0 | 6 | 0 4 | = | 72 | 4 | |
| ..... | 84/ | 4 | 0 | 0 | 6 | 0 6 | = | 81 | 0 | |
| | | | | | | | 153 | 4 | | |
| IRONWORK. | | | | | | | | | | |
| ..... | 84/ | each | 8 lbs. | = | 672 lbs. | | | | | |

BRICK BRIDGES.

ABSTRACT.

| | | | | |
|------------------|-------------|------|----|---|
| Excavation | Cubic Yards | 429 | 22 | 0 |
| Concrete | " " | 214 | 24 | 6 |
| Brickwork | " " | 3983 | 14 | 9 |
| Stonework | Cubic Feet | 1102 | 3 | |
| Woodwork | " " | 153 | 4 | |
| Ironwork..... | Cwt. | 18 | 3 | 0 |

Plate No. 10 exhibits details of two methods of constructing open parapets for bridges; also the foundations, drains, impost stone, &c. for the piers and abutments. In one case the parapet piers of brickwork are shown supported on stone corbels, and the wood posts secured to the masonry by means of wrought-iron forked straps. In the other illustration the parapet consists of wood posts, with rebated sides and slate panels fixed between them, the whole being surmounted with a wood capping secured to the posts by straps of wrought iron.

BRICK CULVERTS.

These culverts are designed in accordance with the form approved by the Engineers' Commissioners, as combining strength, economy, and efficiency. The construction of each is produced by the most simple formula, using the larger diameter as the leading dimension, of which the others are all aliquot parts. Thus the lower diameter is $\frac{5}{8}$ of the larger or datum, as it may be termed; the internal height is $1\frac{1}{3}$ of the datum, and the upper arch and invert are joined by curves whose radius is double the datum. The batter of the front and side walls and the sweep is in all cases one inch to the foot, or 1 in 12. The proportion of the principal dimensions of the transverse section for any required size of sewer accordingly shown in the following scale:—

| | |
|-------------------------------------|---------------------------|
| Major or Upper Diameter..... | = 1 |
| Minor or Lower Diameter..... | = $\frac{5}{8}$ or .625 |
| Height of Section at Centre..... | = $1\frac{1}{3}$ or 1.333 |
| Radius of Side or Joining Arcs..... | = 2 |

Either of these dimensions being given, the rest can be thus readily calculated therefrom.

BRICK CULVERTS.

BRICK CULVERTS. — (Plate No. 11.)

TWO-FEET CULVERT.

| | | | | | Cubic Feet. |
|-------------------------|----|------|-----|-------|-------------|
| Front wall | 1/ | 7 6 | 0 6 | 1 9 = | 6 7 |
| " " " | 1/ | 6 9 | 2 6 | 1 0 = | 16 11 |
| Side walls and sweep... | 1/ | 9 0 | 1 9 | 0 9 = | 11 11 |
| Back wall | 1/ | 5 9 | 1 6 | 0 6 = | 4 4 |
| " " " | 1/ | 5 0 | 5 0 | 0 9 = | 18 9 |
| | | | | | <hr/> 58 6 |
| Per foot run | 1/ | 10 0 | | 0 9 = | <hr/> 7 6 |

THREE-FEET CULVERT.

| | | | | | |
|-------------------------|----|------|-----|-------|-------------|
| Front wall | 1/ | 8 9 | 2 0 | 0 6 = | 8 9 |
| " " " | 1/ | 8 0 | 3 0 | 1 2 = | 28 0 |
| Side walls and sweep... | 1/ | 11 0 | 3 0 | 1 2 = | 38 6 |
| Back wall | 1/ | 6 9 | 1 6 | 0 6 = | 5 1 |
| " " " | 1/ | 6 0 | 7 0 | 0 9 = | 31 6 |
| | | | | | <hr/> 111 6 |
| Per foot run | 1/ | 13 6 | | 0 9 = | <hr/> 10 2 |

FOUR-FEET CULVERT.

| | | | | | |
|--------------------------|----|------|-----|-------|-------------|
| Front wall | 1/ | 10 3 | 2 0 | 0 6 = | 10 3 |
| " " " | 1/ | 9 6 | 4 0 | 1 2 = | 44 4 |
| Sides walls and sweep... | 1/ | 14 0 | 4 3 | 0 9 = | 44 8 |
| Back wall | 1/ | 7 9 | 1 6 | 0 6 = | 5 10 |
| " " " | 1/ | 7 0 | 8 0 | 0 9 = | 42 0 |
| | | | | | <hr/> 147 1 |
| Per foot run | 1/ | 17 0 | | 0 9 = | <hr/> 12 9 |

FIVE-FEET CULVERT.

| | | | | | |
|-------------------------|----|------|-----|-------|-------------|
| Front wall | 1/ | 10 6 | 2 0 | 0 6 = | 10 6 |
| " " " | 1/ | 9 9 | 4 6 | 1 2 = | 51 3 |
| Side walls and sweep... | 1/ | 16 0 | 5 6 | 0 9 = | 66 0 |
| Back wall | 1/ | 8 9 | 1 6 | 0 6 = | 6 7 |
| " " " | 1/ | 8 0 | 9 6 | 0 9 = | 57 0 |
| | | | | | <hr/> 191 4 |
| Per foot run | 1/ | 21 0 | | 0 9 = | <hr/> 15 9 |

SIX-FEET CULVERT.

| | | | | | |
|-----------------|----|------|-----|-------|-------|
| Front Wall..... | 1/ | 15 0 | 2 3 | 0 6 = | 19 10 |
| " " " | 1/ | 14 4 | 1 6 | 5 0 = | 107 6 |

BRICK CULVERTS.

SIX-FEET CULVERT—(continued.)

| | | | | | Cubic Feet. | Yds. Ft. |
|------------------------|----|------|------|-----|--------------|----------|
| le walls and sweep ... | 1/ | 21 0 | 1 2 | 6 0 | = 147 0 | |
| ck wall | 1/ | 9 0 | 2 0 | 0 6 | = 9 0 | |
| " " " | 1/ | 8 4 | 12 0 | 1 2 | = 116 8 | |
| | | | | | <u>400 0</u> | or 14 22 |
| r foot run | 1/ | 26 0 | 0 1 | 0 2 | = 30 4 | or 1 3 |

the transverse section of this culvert, on Plate No. 11, the radius of the side or joining arcs erroneously shown as being 10 feet instead of 12 feet, according to the formula.

EIGHT-FEET CULVERT.

| | | | | | | |
|------------------------|----|------|------|-----|---------------|-------------|
| ont wall | 1/ | 20 0 | 3 0 | 0 6 | = 30 0 | |
| " " " | 1/ | 19 3 | 1 6 | 6 0 | = 173 3 | |
| le walls and sweep ... | 1/ | 28 0 | 1 6 | 8 0 | = 336 0 | |
| ck wall | 1/ | 14 9 | 2 3 | 0 6 | = 16 7 | |
| " " " | 1/ | 14 0 | 15 8 | 1 6 | = 329 0 | |
| | | | | | <u>884 10</u> | or 32 20 10 |
| r foot run | 1/ | 34 0 | | 1 6 | = 51 0 | or 1 24 0 |

THE END.